PRINCIPLES OF
ASSESSMENT MAPPING

LESSON III

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PRINCIPLES OF ASSESSMENT MAPPING

LESSON III

LAND SURVEYS

Ministry of Revenue
Assessment Standards Branch
1979/80

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REV
1977-011

ACKNOWLEDGEMENTS

The Ministry of Revenue wishes to acknowledge the co-operation of the Ministry of Natural Resources in granting permission to reproduce the diagrams of Township Surveys in Part I. These first appeared in the publication 'Crown Surveys in Ontario' by W.F. Weaver, O.L.S., P. Eng. 1962

The Ministry also wishes to acknowledge the co-operation of the Department of Transportation and Communications. The Land Surveys Office supplied the chart on Page 10, and Documents Section supplied the Highway Plans in Part III.

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I Crown Surveys

The Ministry of Natural Resources has the responsibility for all surveys of Crown Land in Ontario. The Records Library is in the Whitney Block, Queen's Park, and contains all original survey notes, township plans, retracement surveys, letters, etc. These records are filed by Township, and photostats may be ordered by mail. (Township plans generally cost $2.00 - $3.00, and survey notes are .35¢ per page.)

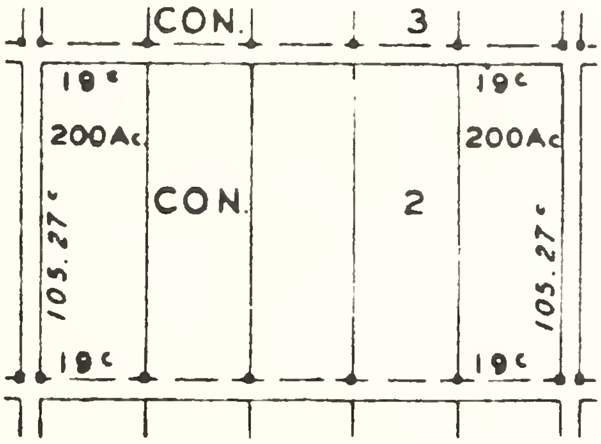
These have been more than a dozen distinct patterns of township surveys since the first five townships were laid out in 1783, to become Kingston, Ernestown, Fredericksburgh, Adolphustown and Marysburgh.

(a) Single Front Townships

These first townships were 'single-front townships', meaning that the survey lines were only run along the fronts of the concessions, and survey posts set at the front lot corners. The size of lots varied over the years from 120 to 210 acres.

Typical section of a single-front township. 1783-1818

Original survey lines run on the ground are indicated by broken lines; original survey posts by small squares.



Road allowances were sometimes between every second lot, sometimes every fifth lot and occasionally every sixth lot.

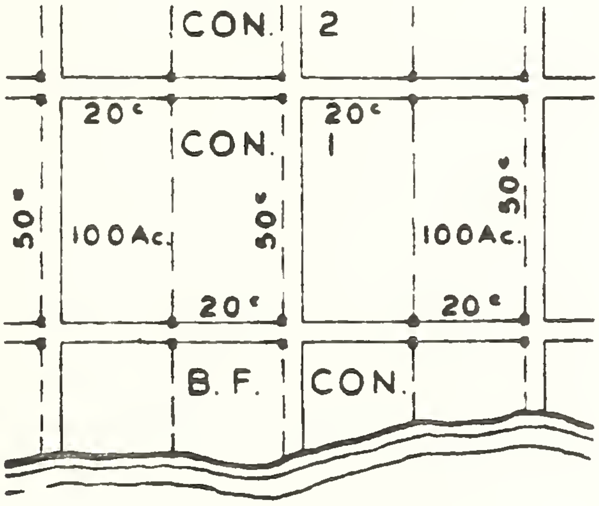
The only distinguishing feature of this system was that only the fronts of the lots were surveyed, leaving the settlers to establish their own side and rear boundaries, with sometimes erratic results. The single-front township is found all along the north shore of Lake Ontario and the St. Lawrence River, and occasionally on the north shore of Lake Erie.

(b) Front and Rear System

A new method called the front-and-rear system was introduced in 1787 in an effort to correct the deficiences of the single-front system. Lots were of only 100 acres, (20 x 50 chains), with a road allowance at every second lot. The lot lines were surveyed and posts planted at the corners.

Typical section of front-and-rear system.
1787-1813

Original survey lines run on the ground are indicated by broken lines; original survey posts by small squares



However, this system involved a considerable mileage of survey line for a relatively small area. Consequently, survey costs were excessive, and only thirteen townships were laid out in this fashion, all in the Niagara Peninsula.

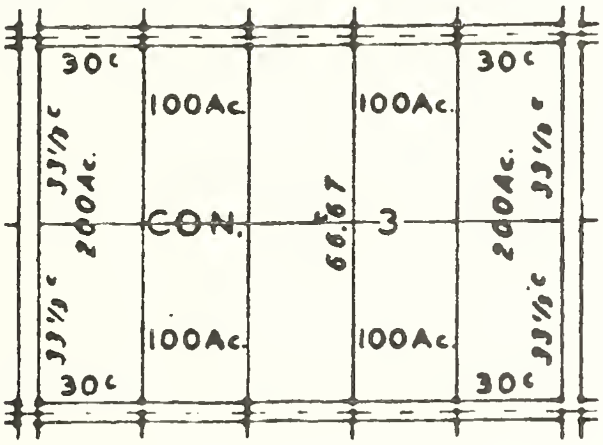
(c) Double Front System

In 1815, a compromise system was adopted, combining the virtues of the two previous methods, in the form of the double-front system.

Lots were 200 acres in size, although they were usually patented in half-lots. Surveys were run along the concession lines, and posts planted at the front corners of the half-lots. Each lot was 30 x 66.67 chains, with a road allowance at every fifth or sixth lot.

Typical section of double-front system, 1815-1829

Original survey lines run on the ground are indicated by broken lines; original survey posts by small squares.



This system was adopted at the time when settlement was moving inland from the two Great Lakes, and so it is found behind, or north of, the single-front townships, in a strip running generally from Ottawa to Chatham.

The weakness of this system, however, was that only the concession lines were surveyed. The surveyors simply worked across a concession line from one township boundary to the other, and then moved up to the next concession line and worked back. Survey posts were planted without any attempt to check them against those planted on the previous concession, over four thousand feet away.

Consequently, with the difficulties of measuring through dense bush, errors occurred and went undetected. By the time

the surveyor was three or four lots from the township boundary, the lot corner posts were no longer opposite to each other. By the time he had gone several miles, the lot corners could be hundreds of feet off square!

The result was that "jogs" occurred at the half-lot lines as the settlers established their boundary fences from opposite concession lines. The road allowances also jogged of course, producing abrupt 'S-Bends' at the centre of each concession! To prevent the continuance of this far from satisfactory arrangement, an Order-in-Council was passed in 1829 providing for the sectional system of township surveying, in which the township was surveyed into "blocks" by including the sideroads in the survey.

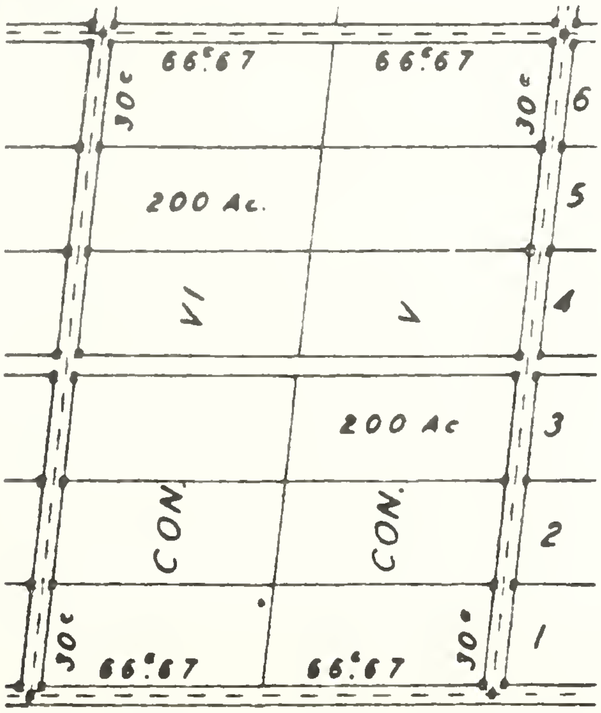
(d) 2400 Acre Section

The first type was the 2,400 acre section, which was only a slight variation from the double-front system.

Typical section of 2,400-acre sectional system, 1829-1851

Sectional Township with Double Fronts

Original survey lines run on the ground are indicated by broken lines; original survey posts by small squares.



The lots were the same size as in the double-front system, and survey posts were planted at the front corners. However, the road allowances were at every second concession and every third lot. Alternate sideroads were surveyed, providing a check on the accuracy of the survey. This produced a section consisting of 12 lots each containing 200 acres. Since only alternate concession lines were surveyed, jogs could still occur at the unsurveyed line between concession roads. This system can be found in parts of Western Ontario along the shores of Lake Huron and Georgian Bay and in the Renfrew area.

(e) 1000 Acre Section

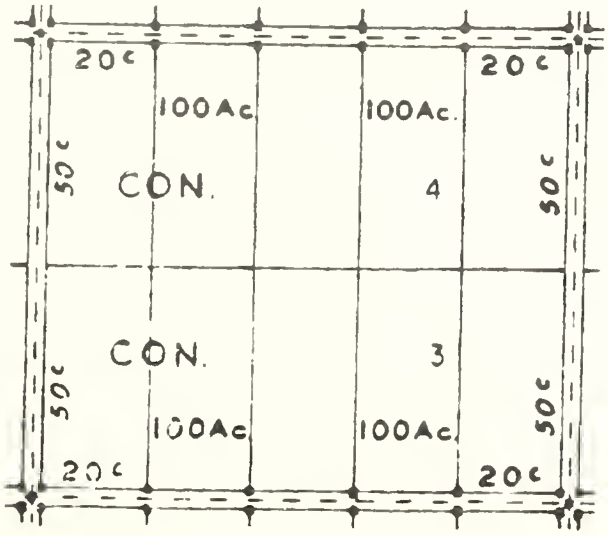
In 1835, the 1,000 acre section appeared. This was used by the Canada Company which had acquired 1,000,000 acres of territory from the Government, and proceeded to subdivide it. The lots contained 100 acres (20 x 50 chains), with a road allowance at alternate concession lines and every fifth lot.

The section thus produced consisted of ten lots of 100 acres each, with survey posts at the front corners.

Typical section of 1,000-acre sectional system, 1835-1906

Sectional Township with Double Fronts

Original survey lines run on the ground are indicated by broken lines; original survey posts by small squares



In 1851 the government adopted this system for Crown surveys with one modification - a road allowance one chain in width along the banks of rivers and lakes.

The 1,000 acre sectional system worked out well, and was used for about 200 townships from Lake Huron to the Ottawa River. Practically all the then unsurveyed land south of North Bay, including Manitoulin Island and the Bruce Peninsula, was laid out under this system.

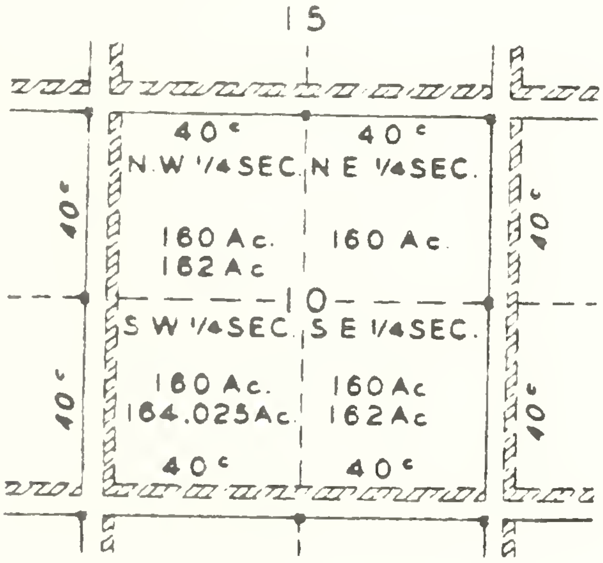
(f) 640 Acre Section

Starting in 1859, some townships were laid out in Northern Ontario using the American system of six-mile townships divided into sections and quarter-sections.

Typical Section of pattern 1 of 640-acre sectional system

Sectional Township with Sections and Quarter Sections, with Road Allowances

Original survey lines run on the ground are indicated by unbroken lines; original survey posts by small squares.



The pattern shown above, with road allowances between sections, was laid out by the Dominion Government and is found in the Fort Frances area. The road allowances were originally laid out 1½ chains wide, but this was later reduced to one chain. The survey posts were planted at the section and quarter-section corners on the south and west sides of the road allowances only.

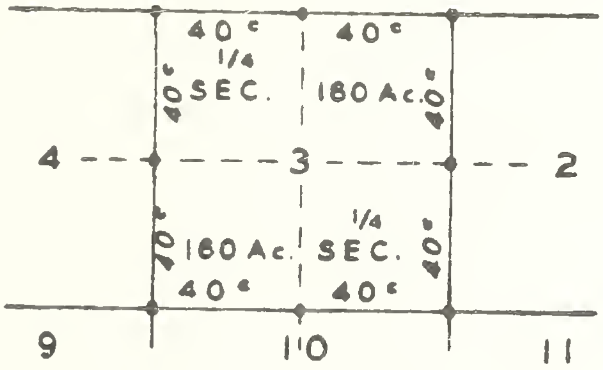
This township contained 36 sections, each one mile square, numbered 1 to 36 starting at the south-east corner of the township. Patents were issued for quarter sections, of 160 acres each. When the road allowances were reduced, however, this increased the size of 3 out of 4 quarter-sections.

The Province adopted the quarter-section system and the following pattern was used around Sault Ste. Marie and parts of the north shore of Lake Huron, and also in the Thunder Bay area.

Typical section of pattern 2 of 640-acre sectional system

Sectional Township with Sections and Quarter Sections, Without Road Allowances

Original survey lines run on the ground are indicated by unbroken lines; original survey posts by small squares.



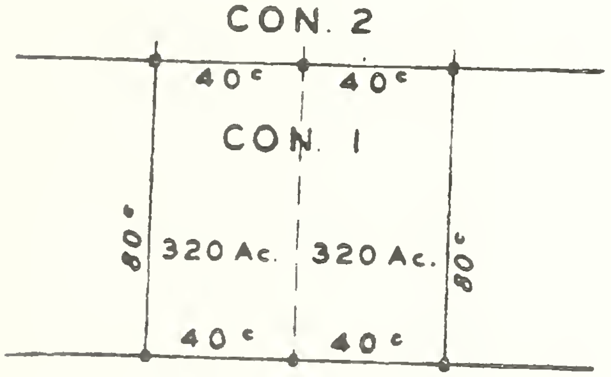
No road allowances were laid out, but 5% was reserved for roads. All section boundaries were surveyed, and posts planted at section and quarter-section corners. These townships also contained 36 sections, numbered 1 to 36, but the numbering commenced from the north-east corner of the township. Patents were again issued for quarter-sections.

The most widely used pattern of the 640 acres system, and one that was used extensively in Northern Ontario, was the type divided into lots and concessions.

Typical section of pattern 3 of 640-acre sectional system

Sectional Township with Single Fronts

Original survey lines run on the ground are indicated by unbroken lines; original survey posts by small squares



In this pattern, the township was divided into concessions one mile deep, consisting of twelve lots of 320 acres each. Again, 5% was reserved for roads. This system is a mixture of earlier types; the framework is sectional, but the lot layout is reminiscent of the original single-front townships.

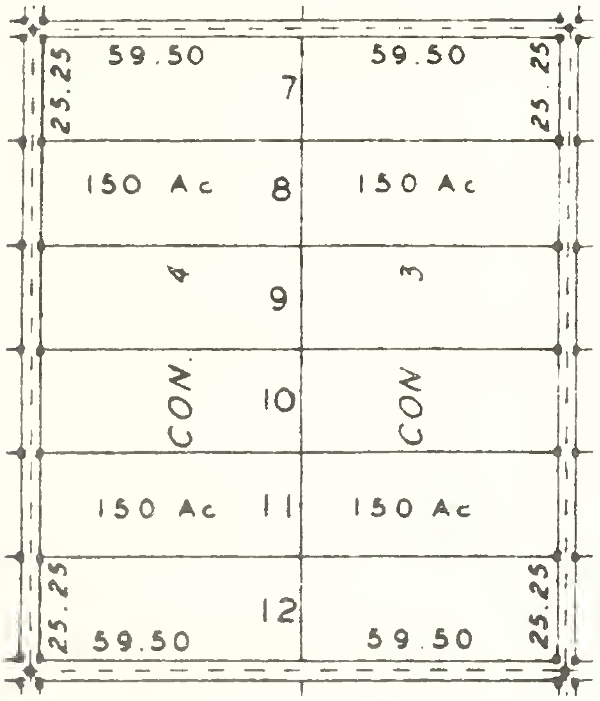
This system was used exclusively until 1906, and is still used in parts of Northern Ontario, in country unsuited for agriculture. It can be found from North Bay to Espanola, east of Sault Ste. Marie, and around New Liskeard, Timmins, Cochrane, Thunder Bay, Nipigon, Dryden, Kenora, and Fort Frances.

(g) 1800 Acre Section

Finally, in 1906, the 1800 acre section, 9 mile township, appeared. It was an obvious modification of the 1,000 acre sectional system used in Southern Ontario

Typical section of 1,800-acre section, 1906
9-mile Square Township
Sectional Township with Double Fronts

Original survey lines run on the ground are indicated by broken lines; original survey posts by small squares.



There were twelve concessions of 28 lots, each containing 150 acres. The road allowance appeared again, at every second concession line and every sixth lot, plus an allowance one chain wide along the banks of rivers and lakes. Survey lines were run along the roads creating sections of twelve lots, with posts at the front lot corners.

This system can be found around Hearst, Smoothrock Falls and Cochrane, and there is a modification of it - the 1,200 acre section - around Kapuskasing.

(h) Other Systems

In addition to these systems, there are some that were laid out in the very early days of settlement that cannot be fitted

into any classification. Along the Detroit River, for example, the lots are long and narrow, running back from the river, in the French pattern.

There are also a number of townships that contain a mixture of two or more systems, with possibly an 'ad hoc' survey here and there along early travelled roads.

The variety encountered by the mapping draftsman will depend on the period in which his region was first settled. The 'oldest' parts of the province, such as the St. Lawrence and Detroit Rivers, and the Niagara Peninsula are the most complex, while the northern parts of the province are survyed uniformly over fairly wide areas.

The following chart provides a comprehensive summary of the various systems that we have discussed:

SUMMARY OF TOWNSHIP SYSTEMS

WHERE LOCATED		SYSTEM	LOT SIZE	LOT DIMENSIONS	ROAD ALLOWANCES	WIDTH OF R.A.	POSTS PLANTED	PATENTED AS	DATE ADOPTED
North Shore of LAKE ONTARIO, LAKE ERIE and ST LAWRENCE RIVER.	1	SINGLE FRONT	200 AC	20 x 100	– EVERY CONCESSION – EVERY 2nd LOT	66'	SINGLE ROW ON FRONT OF EACH CONCESSION	WHOLE LOTS	1783
	2	SINGLE FRONT	200 AC	19 x 105 27	– EVERY CONCESSION – EVERY 5th LOT	40'			
	3	SINGLE FRONT	200 AC	20 x 100	– EVERY CONCESSION – EVERY 5th LOT	66'			
	4	SINGLE FRONT	200 AC	30 x 66.67	– EVERY CONCESSION – EVERY 6th LOT	66'			
	5	SINGLE FRONT	210 AC	26 46 x 79 40	– EVERY 2nd CON – EVERY 6th LOT	66'			
	6	SINGLE FRONT	VARIES	4 TO 12 WIDTH x VARYING DEPTH	VARIES				
NIAGARA	7	FRONT AND REAR	100 AC	20 x 50	– EVERY CONCESSION – EVERY 2nd LOT	66'	WHERE RUN LOT LINES INTERSECT CONCESSION ROAD LIMITS	WHOLE LOTS	1787
North of SINGLE FRONT	8	DOUBLE FRONT	200 AC	30 x 66 67	– EVERY CONCESSION – EVERY 5th or 6th LOT	66'	– ALL LOT CORNERS ON RUN CON LINES – SOMETIMES ℄ OF R A BETWEEN LOT CORS	1/2 LOTS USUALLY	1818
South and West of GEORGIAN BAY.	9	2400 AC SEC	200 AC	30 x 66 67	– EVERY 2nd CON – EVERY 3rd LOT (ONLY ALTERNATE ROADS RUN)	66	– BOTH SIDES OF CONCESSION ROAD ALLOWANCES AT LOT LINES – INTERSECTION OF ℄ OF ROAD ALLOWANCES AT CORNERS OF SECTIONS	WHOLE LOTS	27th MARCH 1829
East of LAKE HURON BRUCE Co. PEMBROKE to GEORGIAN BAY MANITOULIN.	10	1000 AC SEC	100 AC	20 x 50	– EVERY 2nd CON – EVERY 5th LOT – LAKES & RIVERS				(1835) 1651
HEARST, SMOOTH ROCK, COCHRANE	11	(9 MILE TWP) 1800 AC SEC	50	25 25 x 59 50	– EVERY 2nd CON – EVERY 6th LOT – LAKES & RIVERS				24th APRIL 1906
KAPUSKASING	12	1200 AC SEC	100 AC	25 25 x 39 6					24th APRIL 1906
RAINY RIVER Dist	13	(6 MILE TWP) D L S 640 AC SECTION	(SECTION) 640 AC	(SECTION) 1 MILE SQUARE	AROUND EACH SECTION	99' LATER REDUCED TO 66'	SEC AND 1/4 SEC CORNERS ON THE S AND W SIDES OF THE RUN RD ALL'CE	1/4 SEC	1859
PORT ARTHUR, East and West SAULT, N and E	14	ONTARIO 640 AC SECTION	(SECTION) 640 AC	(SECTION) 1 MILE SQUARE	5%		– SECTION AND 1/4 SEC CORNERS – ALL SECTION BDYS RUN	1/4 SEC	
KENORA, FT FRAN, DRYDEN, PT ARTH, NIPIGON, TIMMINS, NEW LISKEARD	15	ONT 640 AC SECTION (LOTS & CONCESSIONS)	320 AC	40 x 80			LOT CORNERS ON FRONT OF CONCESSIONS RUN ALTERNATE SIDE LINES	LOTS OR 1/2 LOTS	
	16	SPECIAL	MAY BE COMBINATION OF THE ABOVE SYSTEMS OR MAY BE A SPECIAL PATTERN OF ITS OWN						

II Subdivision of Township Lots

It did not take very long for the settlers to begin subdividing their land. Usually, they conveyed fractions of their land, eg. the east half of the lot, or the west half of the south half, etc. These fractions are termed Aliquot Parts, and they were rarely, if ever, surveyed.

Consequently, the determination of the exact limits of these aliquot parts is sometimes a fairly involved job for the surveyor, especially where the fences vary considerably from the theoretical boundary line.

(a) Registered Plans

(1) Early Plans

In the early days of settlement, a number of ambitious people visualized entire communities developing on their land, and drew up elaborate plans of subdivision, complete with street names, town squares, etc. Frequently, these people appeared to be unaware of the topography, and so these plans were often quite impractical. However, many of them were registered at the local land registry office, and so became an official record.

Once a plan of subdivision has been registered, all subsequent dealings in the land are recorded under this plan, and the records relating to that portion of the township lot covered by the plan are terminated. Consequently, if a plan was not practical, and land was sold that did not coincide with the lot lines and street patterns on the plan, some very complex drescriptions could result - the property could consist of parts of several lots and road allowances.

Even if the land was sold by registered lot, these old plans were rarely surveyed, so the purchasers simply built

their homes and fences where they thought the lot was! As the subdivision gradually filled up, the land occupancy pattern became chaotic. The present-day surveyor is faced with the task of reconciling the registered description with the physical occupancy.

(2) Present Requirements

Nowadays, plans of subdivision must conform to rigid standards, and be approved by the Ministry of Housing prior to registration. The responsibility for this, rests with the Plans Administration Division.

Title to the land must be certified, and a preliminary plan submitted to the Subdivisions Branch, which then circulates copies to any or all of the following as appropriate:

- the municipality concerned
- the Ministry of Transportation & Communications
- the Ministry of Natural Resources if a lake or river is involved
- the Medical Officer of Health
- the Water Resources Division, Ministry of Environment
- the Hydro Electric Power Commission if a transmission line is affected
- the CN or CP if a railway is affected

Any of these agencies may set conditions which must be met before the subdivision will be approved. The municipality may require that roads, both within and leading to, the subdivision, be brought up to acceptable standards at the expense of the developer; the railway may require a chain-link fence to be installed by the developer, and so on.

Once all conditions have been agreed to, a Subdivider's Agreement is drawn up and registered, and the plan signed by the Minister of TEIGA. Then the surveyor can begin laying

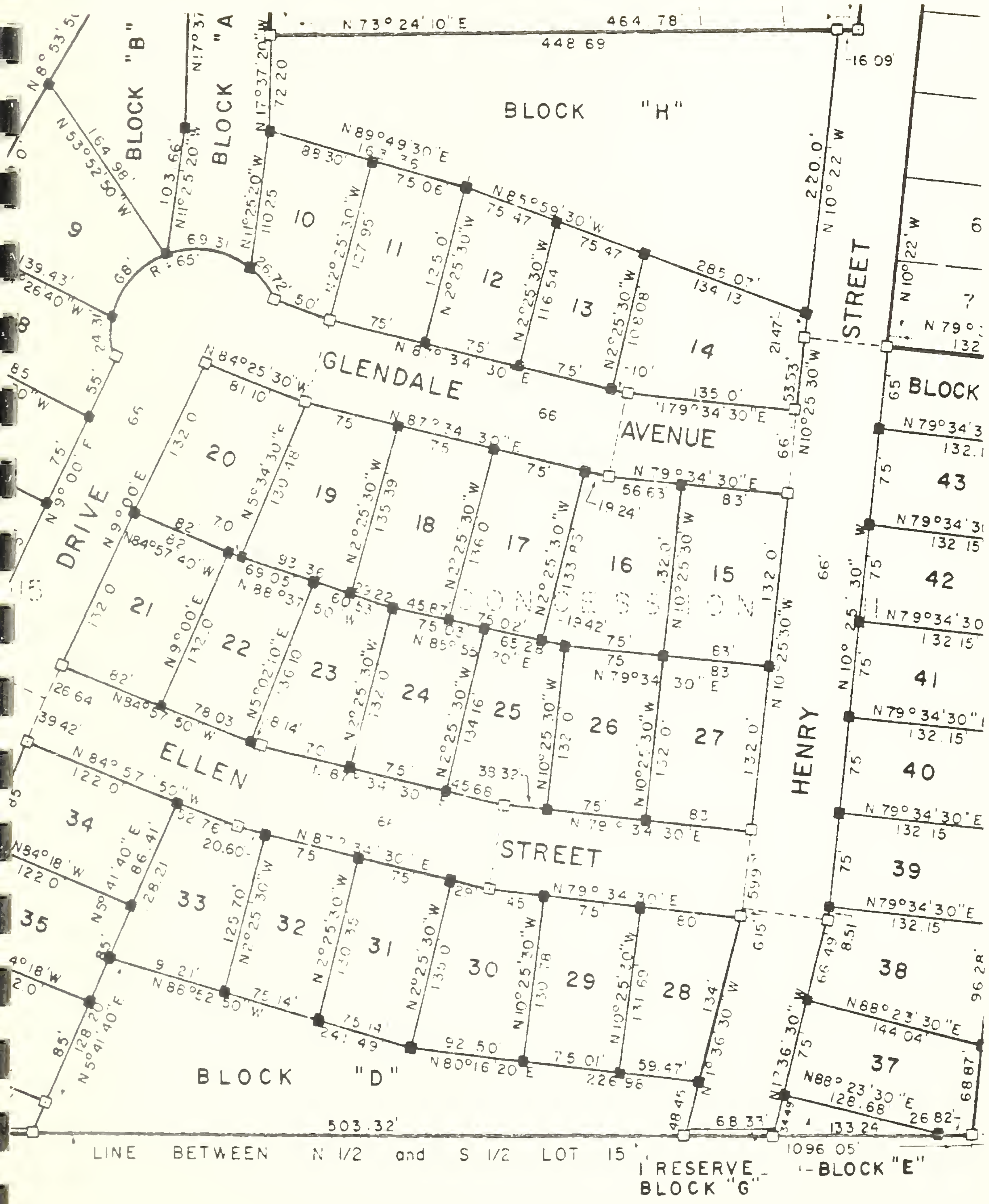
out the subdivision. The average time for obtaining approval, if there are no complications, is about four months; however, some plans of subdivision take years to be approved!

In addition to province-wide subdivision control legislation, there are currently about 2,400 local by-laws affecting the subdivision of land. In addition to this prior control, the municipality has the power to ensure that all conditions are met during development. For example, a plan of subdivision can, by by-law, be deemed to be not registered if a developer fails to meet all his obligations. He is therefore, unable to sell lots until he conforms to the agreement, at which time, the municipality can repeal the by-law.

On the following page is a typical plan of subdivision as finally registered.

Major points, such as changes of bearing, are monumented with a "Standard Iron Bar," (S.I.B.) which is 4 feet long by 1 inch square. All lot corners are marked by an "Iron Bar" (I.B.) which is 2 feet long by 1/2" or 5/8" square. The 1' reserve (Block "G") is held to prevent another subdivider simply continuing the road. It is usually conveyed to the municipality and will be opened when, or if, a road extension is approved and constructed to the standards required by the municipality.

The Registry Office is required to open a separate record for each lot on a registered plan, and record every document affecting that lot. The present day subdivider is required to conform to the pattern of the plan.


BLOCK "H"
BLOCK "B"
BLOCK "A"
BLOCK "D"
BLOCK
RESERVE BLOCK "G"
BLOCK "E"
N 73° 24' 10" E
464.78'
448.69
GLENDALE AVENUE
ELLEN STREET
HENRY STREET
DRIVE
LINE BETWEEN N 1/2 and S 1/2 LOT 15
503.32'
1096.05'
220.0'
N 10° 22' W
N 89° 49' 30" E
N 85° 59' 30" W
N 87° 34' 30" E
N 79° 34' 30" E
N 84° 25' 30" W
N 84° 57' 40" W
N 84° 57' 50" W
N 88° 52' 50" W
N 80° 16' 20" E
N 88° 23' 30" E
N 2° 25' 30" W
N 10° 25' 30" W
N 9° 00' E
N 5° 41' 40" E
R = 65'
9
10
11
12
13
14
15
16
17
18
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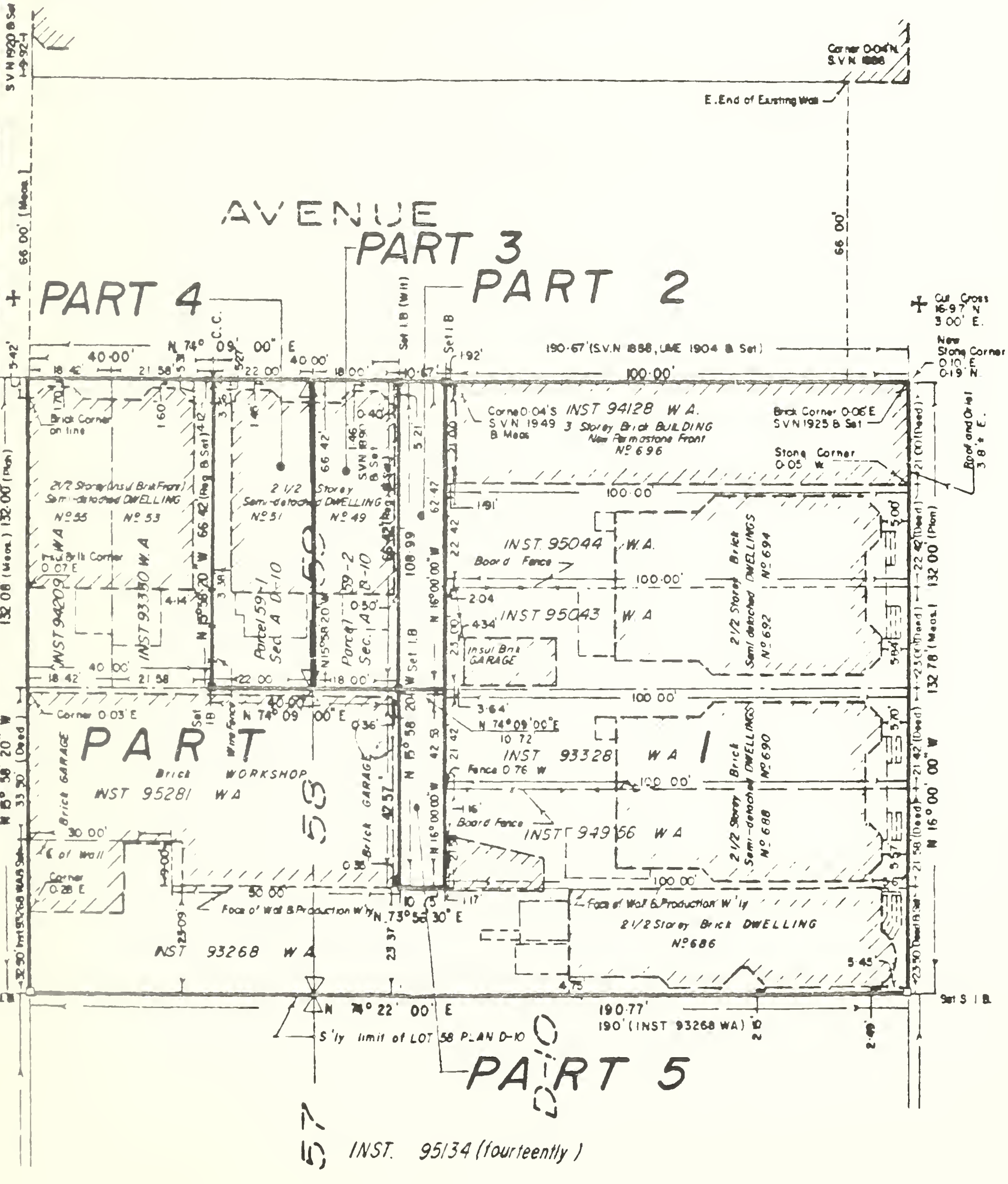
(b) Resurveys

When redevelopment is anticipated, accurate surveys of existing properties must be made. The following example shows a number of properties to which title is being acquired. It is part of a Land Titles reference plan:

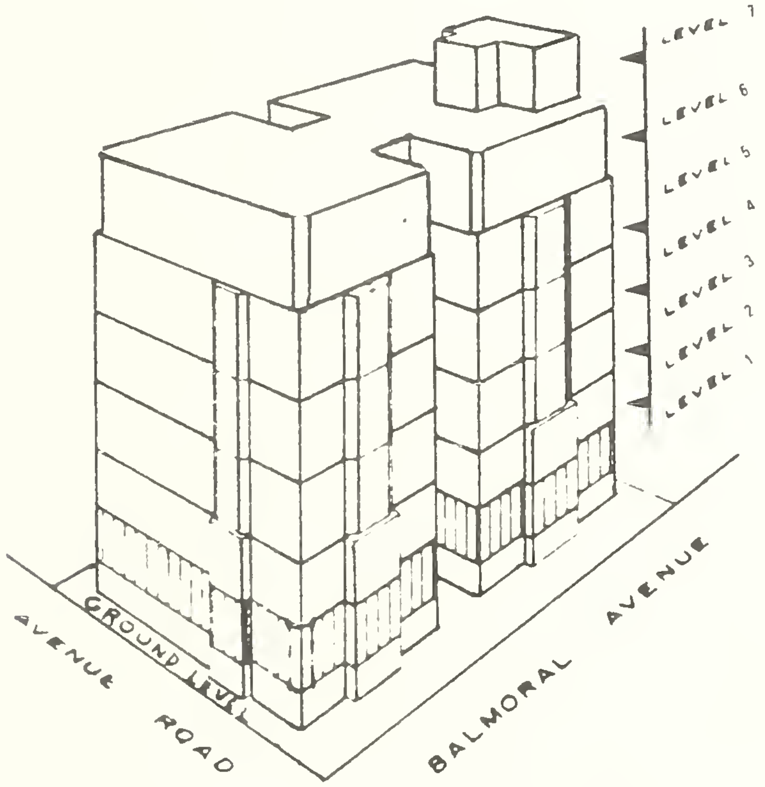


This plan indicates the variation between the original plan measurements, and the existing dimensions - in one case, over nine inches. (There are also at least two lettering errors, pointing up the need for all drafting work to be checked carefully).

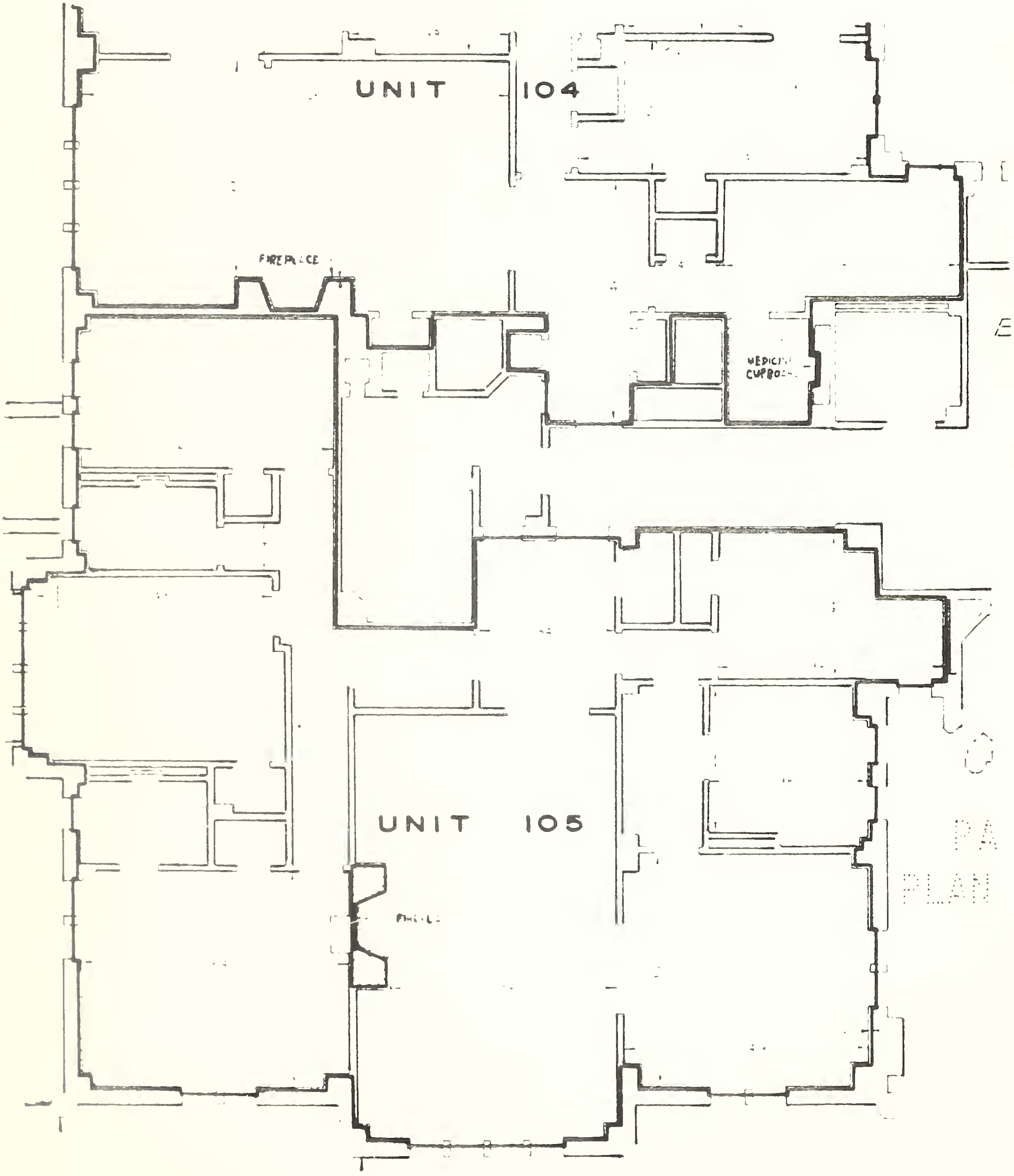
(c) Condominium Plans

Highrise condominium units introduce three-dimensional plans for the assessment office to cope with. The following examples illustrate the technique:

Example A:



Example B:



(d) Public Utility Plans

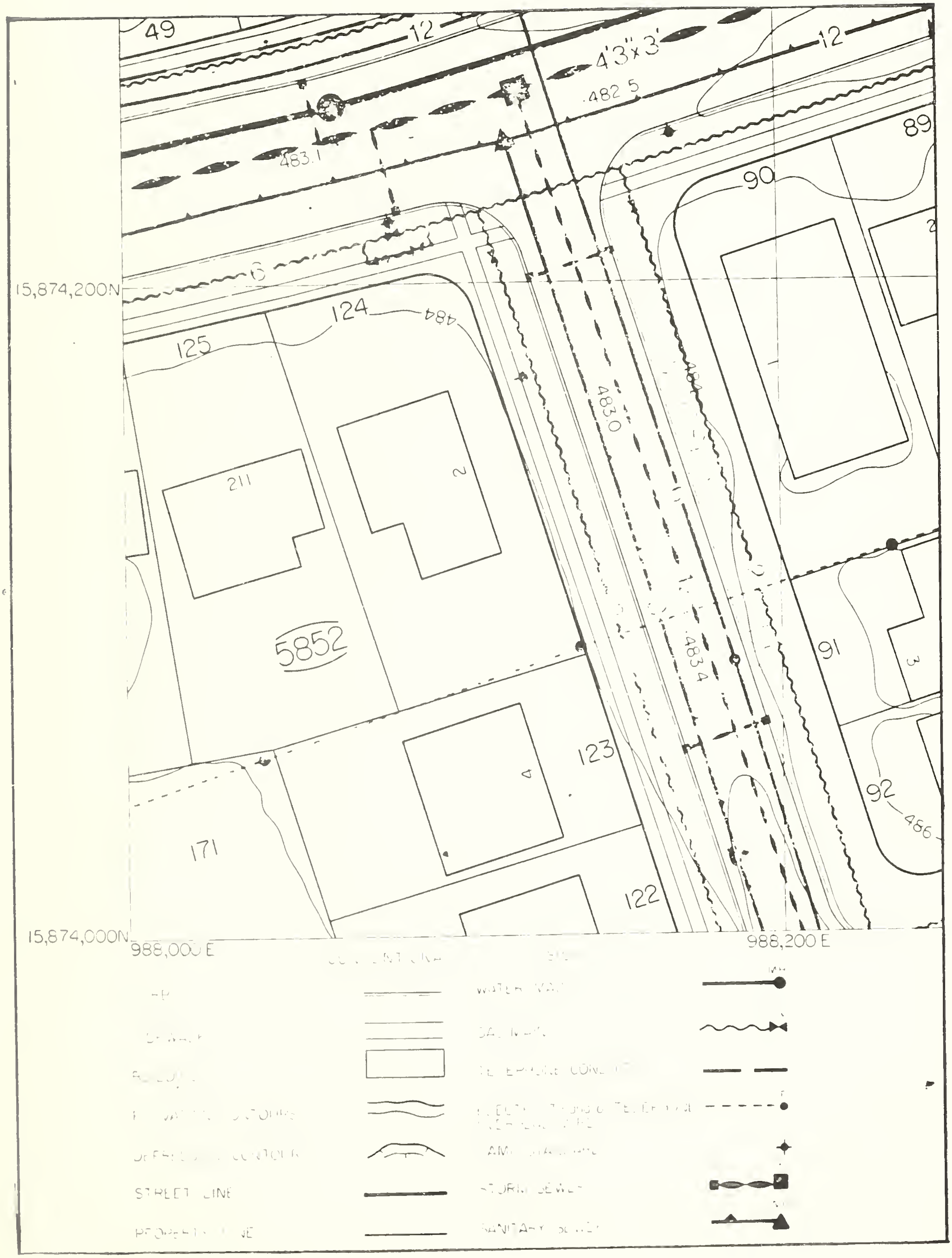
A modern urban area is a maze of underground services - sewers, watermains, gas mains, etc. These have often been installed on a piecemeal basis, with each agency maintaining its own plans.

These services have an influence on the value of the property, and so these plans are of interest to the assessor. The draftsman is frequently able to obtain them as part of his routine information collection, and he should remember that his primary role is to supply information to the assessor.

It is not intended that underground utilities should be illustrated on the regular assessment maps, but the necessary information should be made available. The draftsman could obtain sepia copies of utility plans so that he can supply prints, he could add utilities onto a set of sepias of his assessment maps or he could prepare overlays to supplement his regular maps.

In a few municipalities, consolidations of the various utility plans have been prepared. Metropolitan Toronto has probably the most ambitious procedures - the plans prepared for the Public Utilities Coordinating Committee. These show all services, located by actual survey: for example, refer to Figure C.

"Public Utility Plan"



III Highway Surveys

The Department of Highways has, for many years, conducted legal and topographical surveys. These plans are filed in the Documents Section of the Services Branch. Copies may be obtained by contacting:

Manager of Record Services
Record Services Section
East Wing, Administration Building
Ministry of Transportation
and Communications
Downsview, Ontario
Telephone: 248-3531

There is usually no charge for reasonable numbers of plans. The plans of greatest interest to the mapping draftsman are listed below. There is more than one series, depending on whether the plan is a legal survey or an engineering survey. It is necessary, therefore, to specify which series is required.

Engineering Surveys:

(a) 'B' Plan

This is an engineering survey plan, usually at a scale of 1" = 100', or 1" = 50' in built up areas. It shows all physical features within a reasonable distance of the highway, approximate property lines, and owners' names at the time of the survey. It can be extremely useful if property locations along the highway are vaguely described. The following examples are reduced .

Figure D

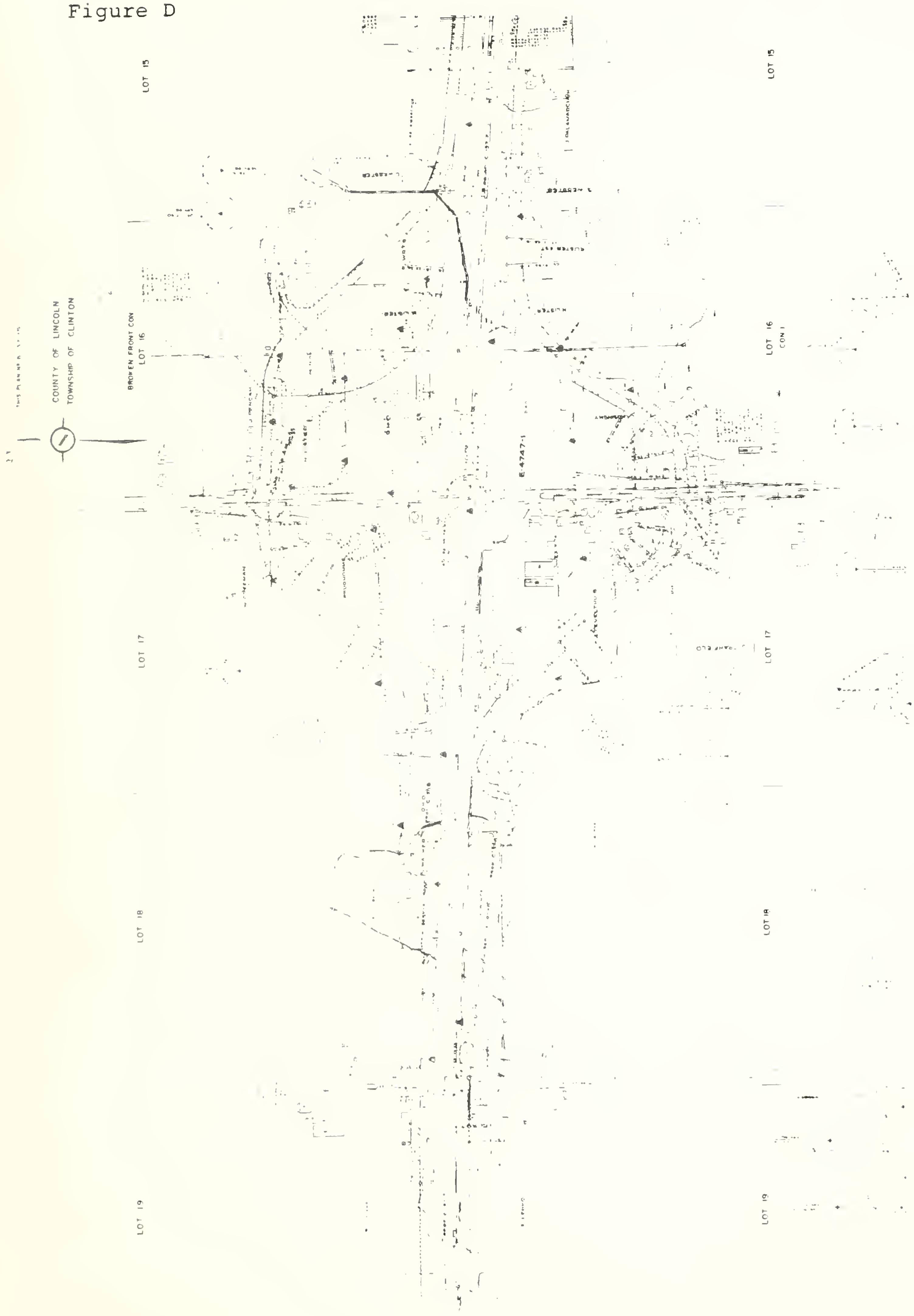
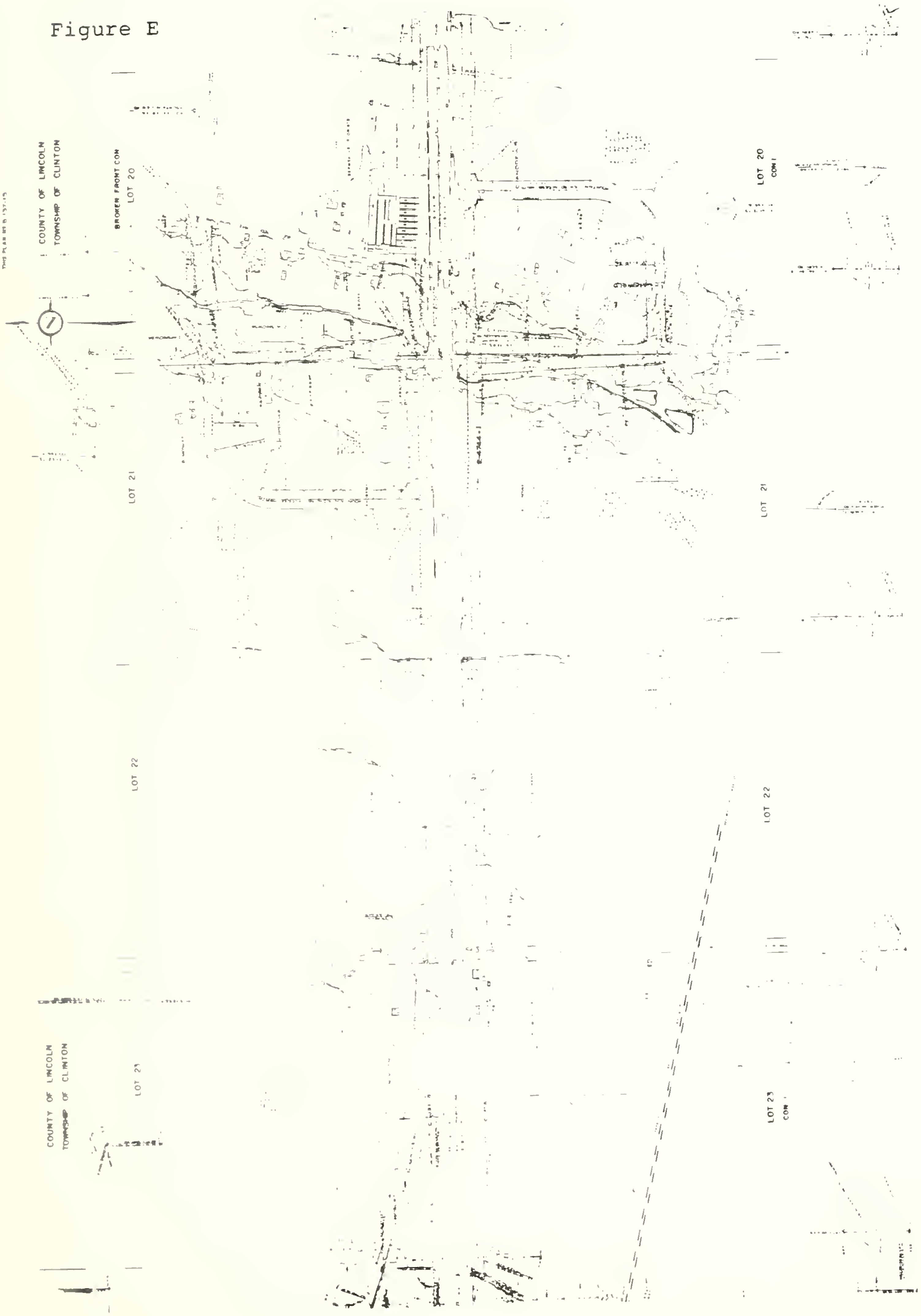

COUNTY OF LINCOLN
TOWNSHIP OF CLINTON
BROKEN FRONT CON
LOT 15
LOT 16
LOT 17
LOT 18
LOT 19
LOT 15
LOT 16
CON 1
LOT 17
LOT 18
LOT 19
E-4747-1

Figure E


COUNTY OF LINCOLN
TOWNSHIP OF CLINTON
BROKEN FRONT CON
LOT 20
LOT 21
LOT 22
LOT 23
COUNTY OF LINCOLN
TOWNSHIP OF CLINTON
LOT 20
CON I
LOT 21
LOT 22
LOT 23
CON I

Nowadays, aerial photography is used extensively by the Ministry of Transportation & Communications, and the example Figure F on the following page is of a recent "B" plan, again reduced for publication from the original scale of 1" = 100'.

(b) 'F' Plan

This is a study plan which may precede a major highway project. It is usually at a scale of 1" = 400', and shows physical details and owners' names. The value of this type of plan in a mapping project is too obvious to justify comment. The reductions on the following pages speak for themselves:

Figure F "B" Plan

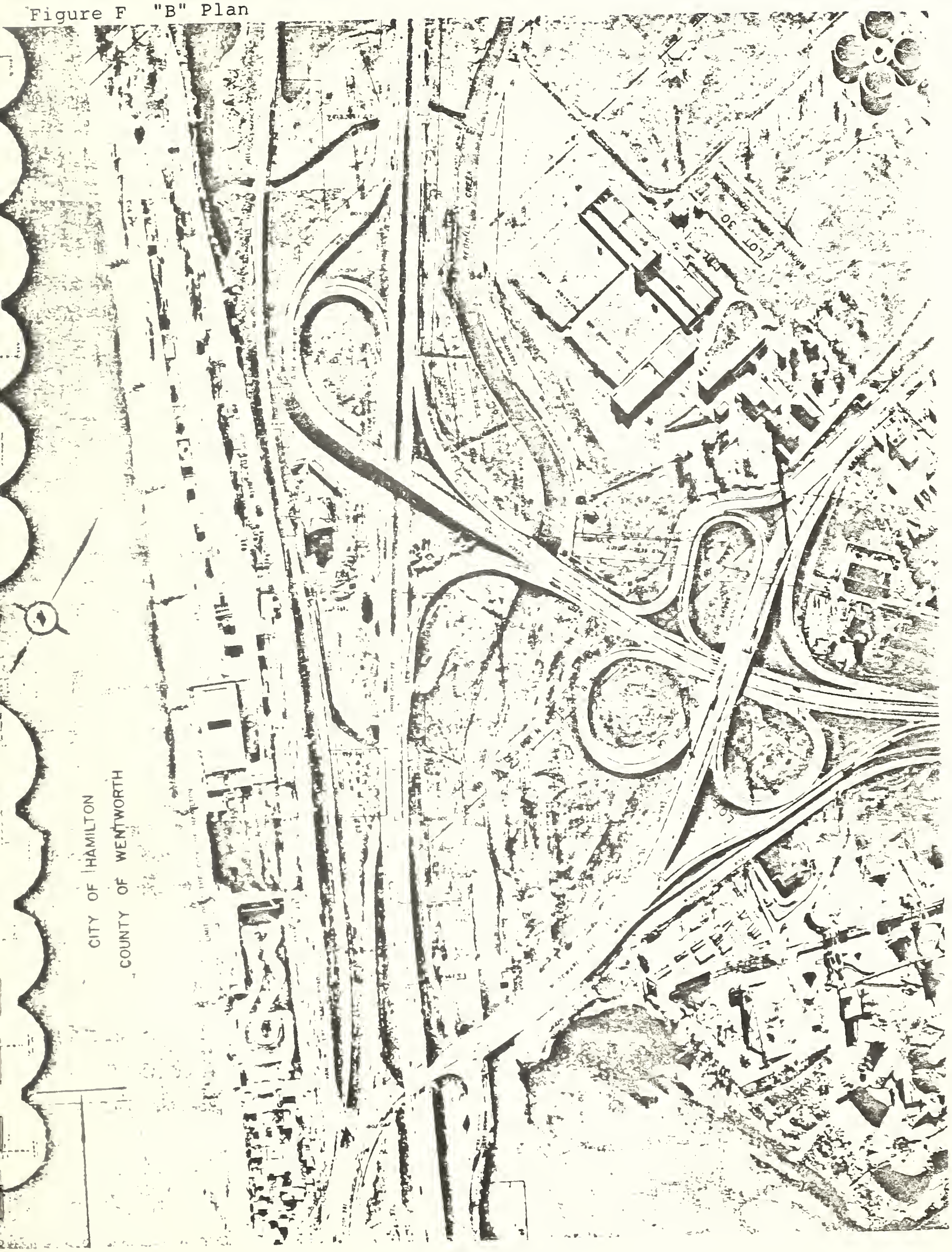


Figure G "F" Plan

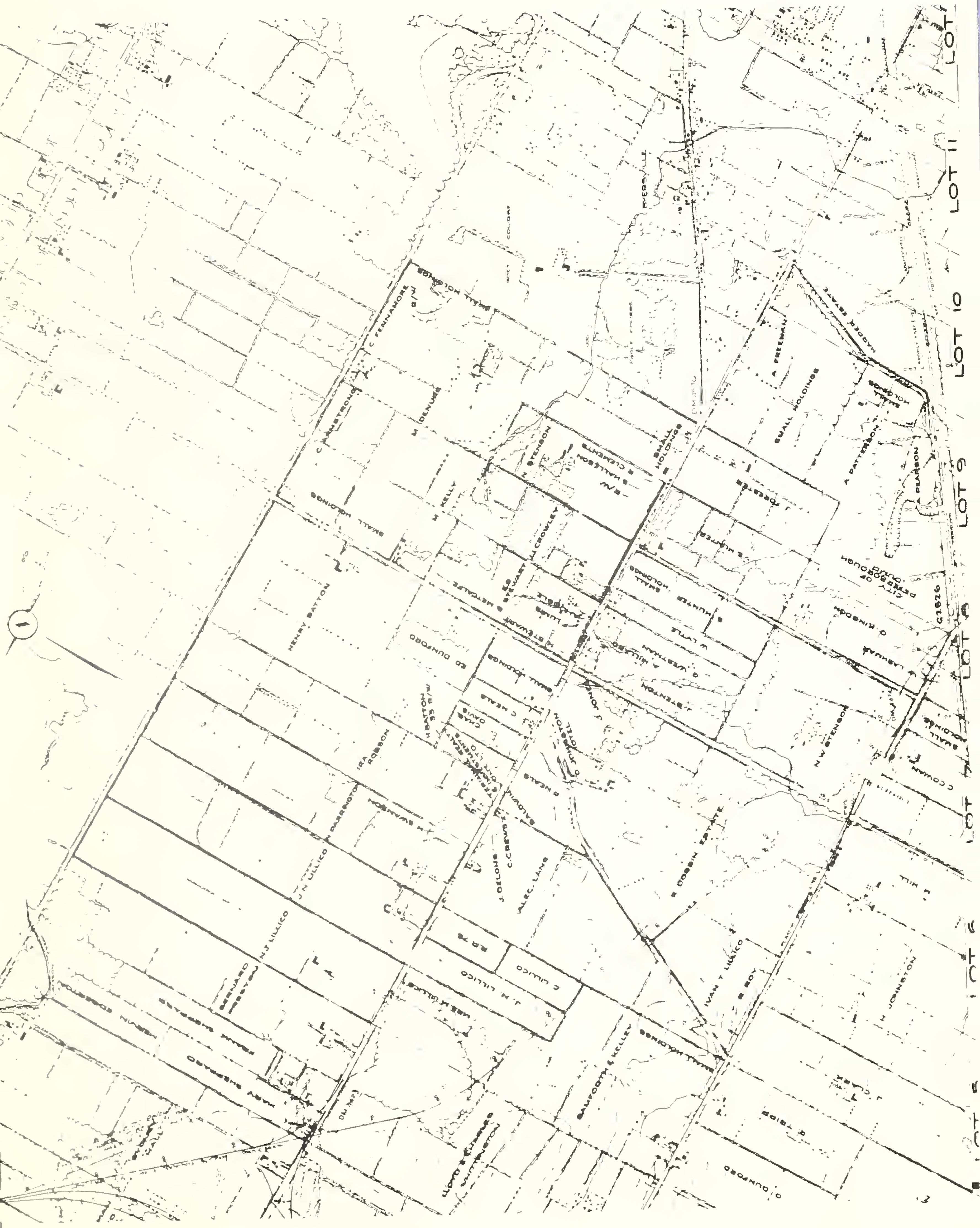
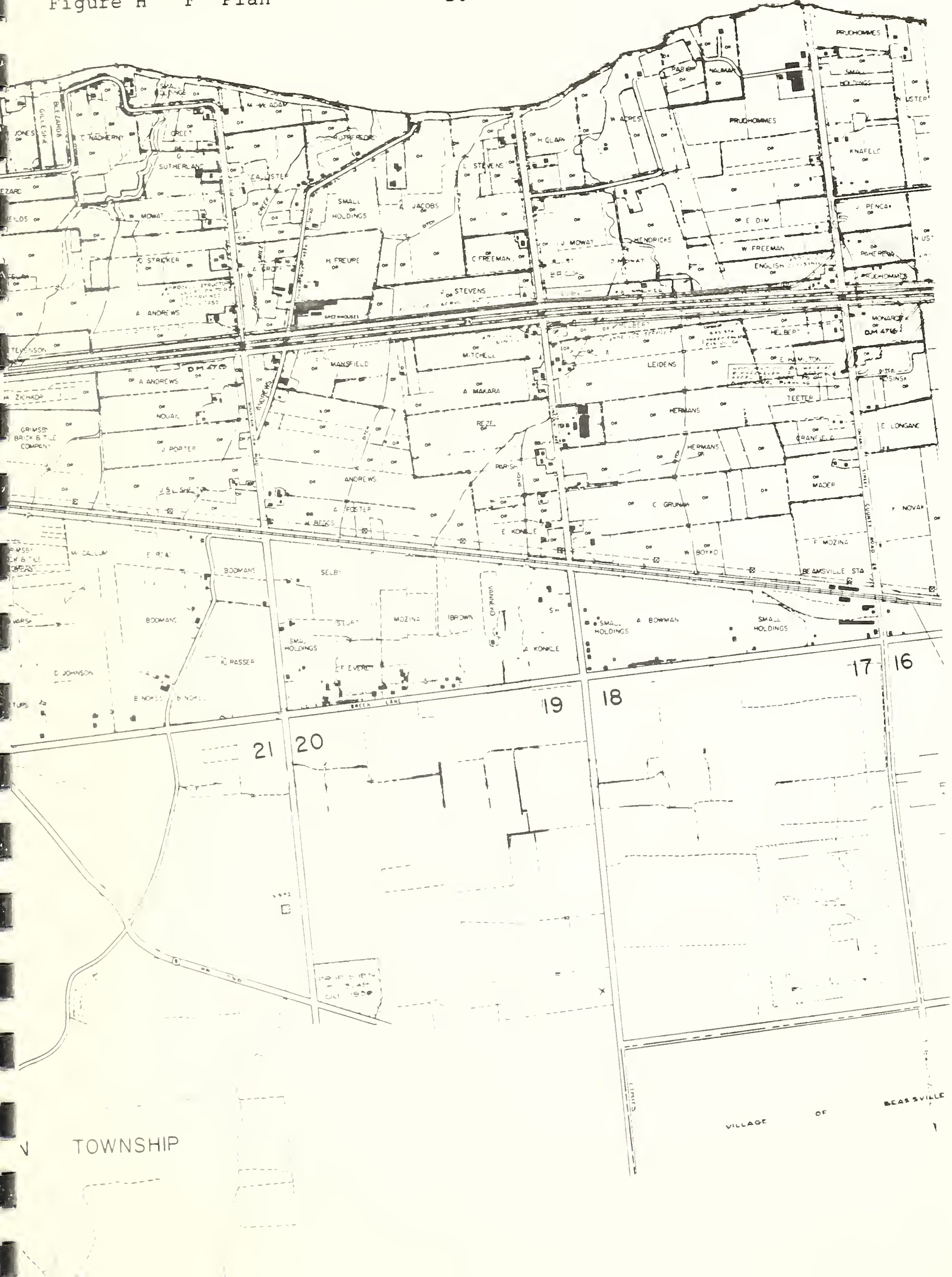


Figure H "F" Plan



The value of the plans discussed so far is obvious, yet they are not registered, and the draftsman will have no way of knowing about them unless he contacts the Ministry of Transportation and Communications.

It is suggested, therefore, that it would be worthwhile to write to the Record Services Section prior to the commencement of mapping in a municipality to find out whether such plans are in existence. They are filed at M.T.C. by highway number and township.

Legal Surveys

a) Plan Type "A"

This is an expropriation plan, and will be filed in the local Registry of Land Titles Office, so copies can be obtained from these sources.

b) Plan Type "C"

This is a designation plan, and illustrates a highway designated by the Lieutenant Governor in Council as:

(a) the King's Highway,
(b) a Secondary Highway,
(c) a Tertiary Road,
(d) a Resource Road, or
(e) a Controlled-Access Highway,

These plans lack dimensions, but they indicate the extent of M.T.C.'s ownership. They are normally at a scale of 1" = 200', and provide valuable information on concession depths, approximate lot lines, etc. Consequently, they are almost a primary source of information when mapping rural areas, and they are much more common than the

other types. Also, since, they are registered, they are readily available from the local Registry Office.

c) Plan Type "U"

This is a reference plan, usually registered for the purpose of acquiring or disposing of land by deed or transfer. Occasionally, it is used for illustrating land referred to in Orders in Council, etc.

Now that expropriation of land is usually by deed, this type of plan is becoming more common.

ASSIGNMENT LESSON III - EDITION TEN

1. Prepare a map of your region indicating the survey system(s) within it and describe it (them) indicating any problems in working with them.

2. Indicate and explain some of the plans that your mapping section receive and describe how they are used in the course of mapping your regions for assessment purposes.

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